

## DESCRIPTIONS OF IMMATURE STAGES OF *NEMATUS DESANTISI* (HYMENOPTERA: TENTHREDINIDAE), A PEST OF SALICACEAE IN ARGENTINA AND CHILE<sup>1</sup>

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**ABSTRACT:** The egg, first- and last-instar larvae, prepupa, and pupa of *Nematus desantisi* Smith are described and illustrated. This species is a serious pest of *Salix* spp. and *Populus* spp. in Argentina and Chile.

Only three species of the tenthredinid subfamily Nematinae are known in South America: *Pristiphora brasiliensis* Malaise, *P. plaumanni* Wong, and *Nematus desantisi* Smith. Host plants of the *Pristiphora* species are unknown. *Nematus desantisi* is a serious pest of *Salix* spp. in much of Argentina and Chile, but it has also been recorded from *Populus* spp. in Argentina (Gianti and Dapoto 1990). Reproduction of *N. desantisi* is by thelytokus parthenogenesis (De Santis and Gallego de Sureda 1984), which facilitates its development as a pest.

The earliest record of *N. desantisi* is from Chubut, Argentina, in 1980 (De Santis 1981), and shortly after it was described by Smith (1983). Later it was collected in Chile (González *et al.* 1986, González 1989) and in the Argentina provinces of Rio Negro, Neuquén, Mendoza, San Juan, San Luis, Buenos Aires (De Santis and Gallego de Sureda 1984), Catamarca (Vattuone 1989), and Tucumán, Salta, and Jujuy (Ovruski 1991, Ovruski and Fidalgo, 1991). De Santis and Gallego de Sureda (1984), Mallea *et al.* (1985), González *et al.* (1986), González (1989), and Gianti and Dapoto (1990) provided some biological data and gave brief descriptions of the egg, late-instar larva, cocoon, pupa, and adults.

This paper, part of the graduation thesis of the senior author (Ovruski 1991) includes a detailed description of the egg, external morphology of the first- and last-instar larvae, prepupa, and pupa of this serious pest. The descriptions are from series of specimens collected on willow in Tafí del Valle, Tucumán Province, Argentina, in January, March, and October of 1990, and reared in the laboratory. Larval terminology is based largely on that of Wong (1963).

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## Description of Immature Stages

**Egg** (Fig. 1). Length, 1.0-1.2 mm. Entirely green; elongated kidney-shaped with one end narrow and slightly curved, averaging from 0.26-0.28 mm in diameter; other end broader, averaging from 0.37-0.39 mm in diameter, with narrowly rounded apex; chorion smooth. Described from numerous series of eggs laid in leaves on first day of oviposition, and from mature ovarian eggs from females reared in laboratory.

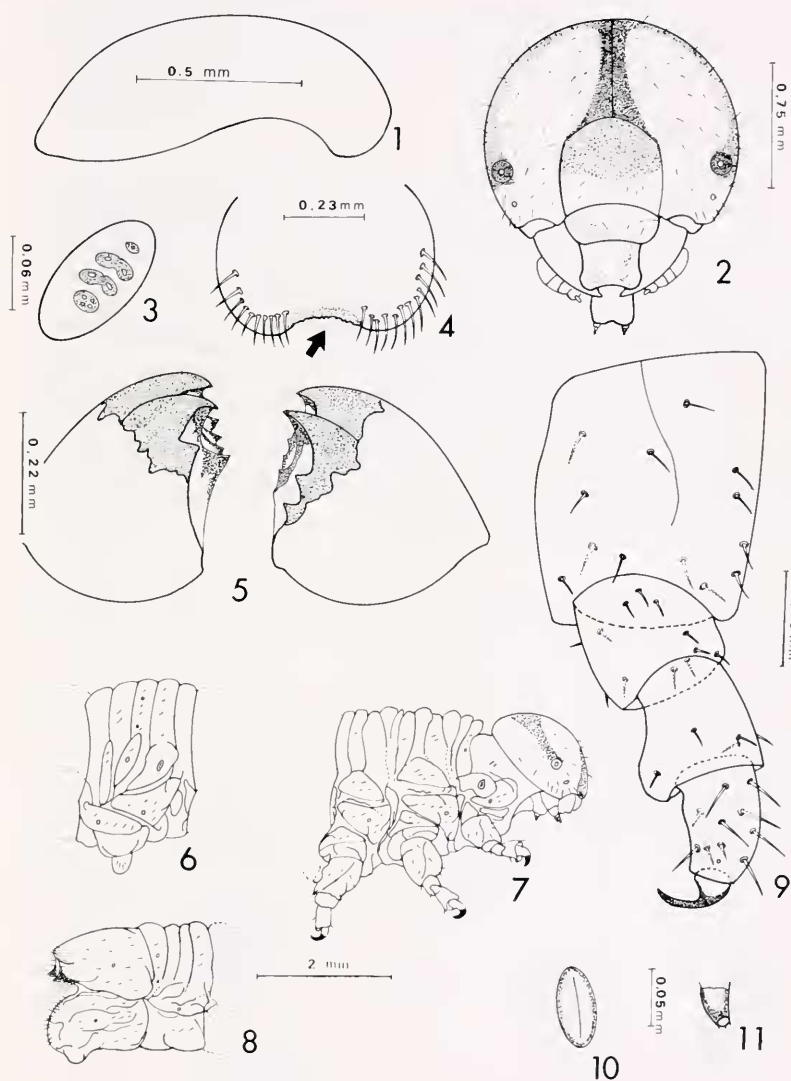
**Last-instar larva** (Figs. 2-11, 18). Length, 17-20 mm. Head capsule pale yellow with black eyespots; longitudinal dark brown to black band present along coronal suture, and a light brown band from vertex laterally to each ocellarium; dorsal half of frons, antenna, clypeus, maxillary palpus, labial palpus, and basal part of mandible light brown; apex of mandible black.

Body entirely green when alive, with two darkened dorsolateral lines; thoracic legs pale yellowish with dark brown tarsal claws; apex of epiproct and caudal protuberances (pseudocerci of Middleton 1921) light brown.

Head capsule (Fig. 2) circular in front view, with few scattered setae that are about 0.09 mm long and slightly longer setae on genae. Antenna (Fig. 3) with 4 segments, each reduced to short sclerotized pieces included in oval antacoria; 1st segment very small and subcircular, its diameter at least half diameter of apical segment and bearing light colored sensory pit; 2nd and 3rd segments crescent-shaped and almost equal in size, each with two light-colored sensory pits; 4th (apical) segment subcircular and bearing four light-colored sensory pits. Clypeus wider than long and bearing 4-6 setae. Inner surface of labrum (Fig. 4) with apical margin emarginate and sinuous at the middle, lateral margins rounded, with 10-12 long setae on each side. Mandibles asymmetrical, strongly sclerotized; each with two large sharp teeth and five smaller lateral teeth (Fig. 5). Maxillary palpus 4-segmented, 2nd segment with 1 seta, longer than 3rd and 4th segments combined; lacinia with 10-12 short spines; palpifer with 4 setae. Labial palpus 3-segmented.

Prothoracic, mesothoracic, and metathoracic terga (Fig. 7) each apparently divided into 4 annulets and with few setae. Prothorax with a large spiracle and a single pore slightly below spiracle. Second prothoracic annulet bearing one pore positioned dorsolaterally. Mesothoracic and metathoracic segments similar to each other; preepipleurite with 5-6 setae and a single pore; postepipleurite with 2 setae. Middle thoracic leg (Fig. 9) with subrectangular coxa, 1.25X longer than wide, with 13-16 scattered setae each about 0.09 mm long; trochanter subquadrate, slightly longer than broad, with 10-12 setae that are 0.05 mm in length; femur subcylindrical, with 6-7 setae similar to the former and 1 seta on femoral process; tibia subcylindrical, 2X longer than wide, with 7-8 scattered setae that are 0.10 mm in length and 3-4 shorter setae and one pore on apical margin; tarsus with a simple claw.

Abdominal segments 2-7 and 10 with prolegs (Fig. 18); segments 1-8 each with 5 dorsal annulets; 9th segment divided into 4 annulets, and 10th without annulets. Third abdominal segment (typical abdominal segment) as follows (Fig. 6): 1st and 5th annulets glabrous; 2nd annulet with vertical row of 4 setae dorsolaterally; 3rd annulet with vertical row of 4 setae and 2 pores on dorsum and pleuron; 4th annulet with 2 setae located subdorsally; with small spiracle; postspiracular area with 1 pore and 1 seta above pore (sometimes absent); preepipleurite nearly always with 5 setae (occasionally 4) and a single pore; postepipleurite usually with longitudinal row of 5 setae and 1 pore; an emarginate lobe bearing 2 setae posterior to postspiracular area; proleg usually with 3 to 4 setae. Ninth segment apparently with 4 dorsal annulets, distribution of setae and pores as in Fig. 8. Epiproct with a pair of caudal protuberances, several short setae and 1 pore. Numerous setae about 0.10 mm in length on subanal and suranal lobes (Fig. 8). Spiracles of abdominal segments 1-7



Figs. 1-11. *Nematus desantisi*. 1, Egg. 2-11, Last-instar larva. 2, Head capsule, front view. 3, Antenna. 4, Inner surface of labrum. 5, Left and right mandibles, dorsal view. 6, Third abdominal segment. 7, Head and thorax. 8, Apical abdominal segments. 9, Middle thoracic leg. 10, Spiracle of third abdominal segment. 11, Pore.

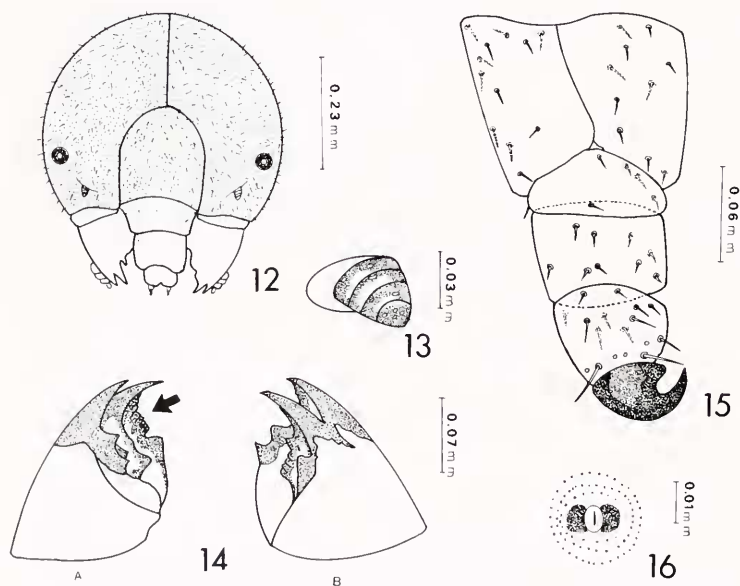
vertical, oval-shaped, and 2.25X longer than wide (Fig. 10), 8th abdominal spiracle longer and very similar to prothoracic spiracle. Pores with 3 dark sharp protuberances on edge of opening (Fig. 11). Eversible ventral glands present on abdominal segments 1-7, situated between and slightly anterior to prolegs (not evident unless fully extended). Integument with very small grayish granules.

Described from a series of 10 larvae, collected from *Salix humboldtiana* Willdn., and *S. babylonica* L. in Tafi del Valle.

**First-instar larva** (Figs. 12-17).—Length, 1.5-2.0 mm at hatching, and reaching to 3.5-4.0 mm at beginning of second instar. First-instar (Fig. 17) similar to last-instar, except for coloration of head capsule, mouthparts, thoracic legs, epiproct and caudal protuberances, morphology of antenna, mandibles, thoracic legs, and abdominal spiracles, and distribution, number, and types of setae on head capsule, thorax, and abdomen.

Head capsule and mouthparts brownish black, same color as thoracic legs, except trochanters which are greenish brown. Body, at hatching, translucent with grayish tone, but pale green after feeding. Apex of epiproct and caudal protuberances dark brown.

Head capsule (Fig. 12) with numerous small setae each about 0.02 mm in length. Antenna (Fig. 13) elongate, cone shaped; basal 3 segments ring-shaped and apical segment subconical; diameter of 1st segment subequal to length of antenna, bearing 2 light-colored sensory pits; 2nd and 3rd segments bearing a single light-colored sensory pit, and 4th segment bearing 4 light-colored sensory pits. Left mandible (Fig. 14A) with 7 sharp teeth, 2 of which are very large and sharp, and a single, large, saw-shaped tooth; right mandible (Fig. 14B) with 6 sharp teeth and 1 large saw-shaped tooth.



Figs. 12-16. *Nematus desantisi*, first instar larva. 12, Head capsule, front view. 13, Antenna. 14A, Dorsal view of left mandible. 14B, Dorsal view of right mandible. 15, Middle thoracic leg. 16, Spiracle of third abdominal segment.

Middle thoracic leg (Fig. 15) with coxa subquadrate, bearing 20-22 scattered short setae each about 0.02 mm in length; trochanters subtriangular, 2X broader than long, with 6 short setae; femur subquadrate, 1.25X broader than long, with 9-10 short setae; tibia subquadrate, with 5 setae each about 0.03 mm in length, and 6-7 setae 0.015 mm in length, 2 large setae each about 0.05 mm in length and 4 pores near apical margin; tarsus with a large, curved tarsal claw.

Third abdominal segment with vertical row of 3 setae on both 1st annulet and 2nd annulets; vertical row of 4 setae on 4th annulet; 3rd and 5th annulets glabrous; spiracle subcircular (Fig. 16), about as long as wide, with brownish spots on anterior and posterior sides, and grayish granules surrounding it on all sides; postspiracular area with 2 setae; preepiplurite with 5-6 setae; postepiplurite with longitudinal row of 6-7 setae; 3 setae on lobe posterior to postspiracular area; proleg with 6, occasionally 7, setae. Pores not found.

Described from 10 larvae reared in the laboratory.

**Prepupa and pupa** (Figs. 19, 20).— Initially (first day), prepupa very similar to last-instar larva. On second day, body curved and reduced in size, averaging 7.5 mm in length (Fig. 19). Head capsule pale green, but with light brown lateral bands, longitudinal blackish band on coronal suture, and light brown spot on frons; thoracic legs greenish brown and body dark green.

Pupa initially somewhat tough, entirely green with light brown eyes, averaging 7.8 mm in length; antenna curved posteriorly, exterior to wings and extended to 4th abdominal segment; prothoracic and mesothoracic legs and wings curved toward ventral surface of thorax; metathoracic legs extend to 5th abdominal segment. Mature pupa (Fig. 20) more sclerotized; head, antenna, thorax, and thoracic legs yellowish brown; mandibles dark brown, eyes black, and abdomen light green.

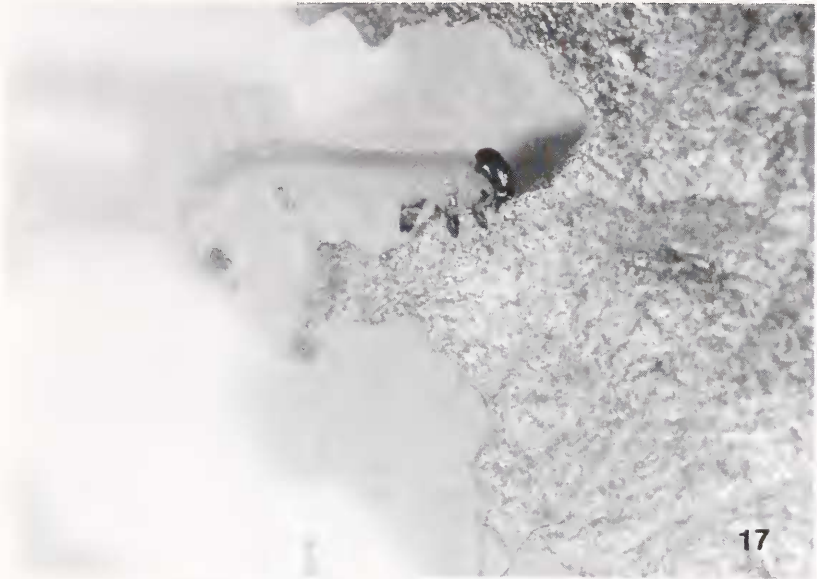
Fifteen prepupae and pupae, reared in the laboratory from larvae collected in Tafi del Valle, were studied. The prepupa transforms to the pupa and adult stage inside a yellowish brown oval cocoon from 7-8 mm long and from 3-4 mm in diameter.

## DISCUSSION

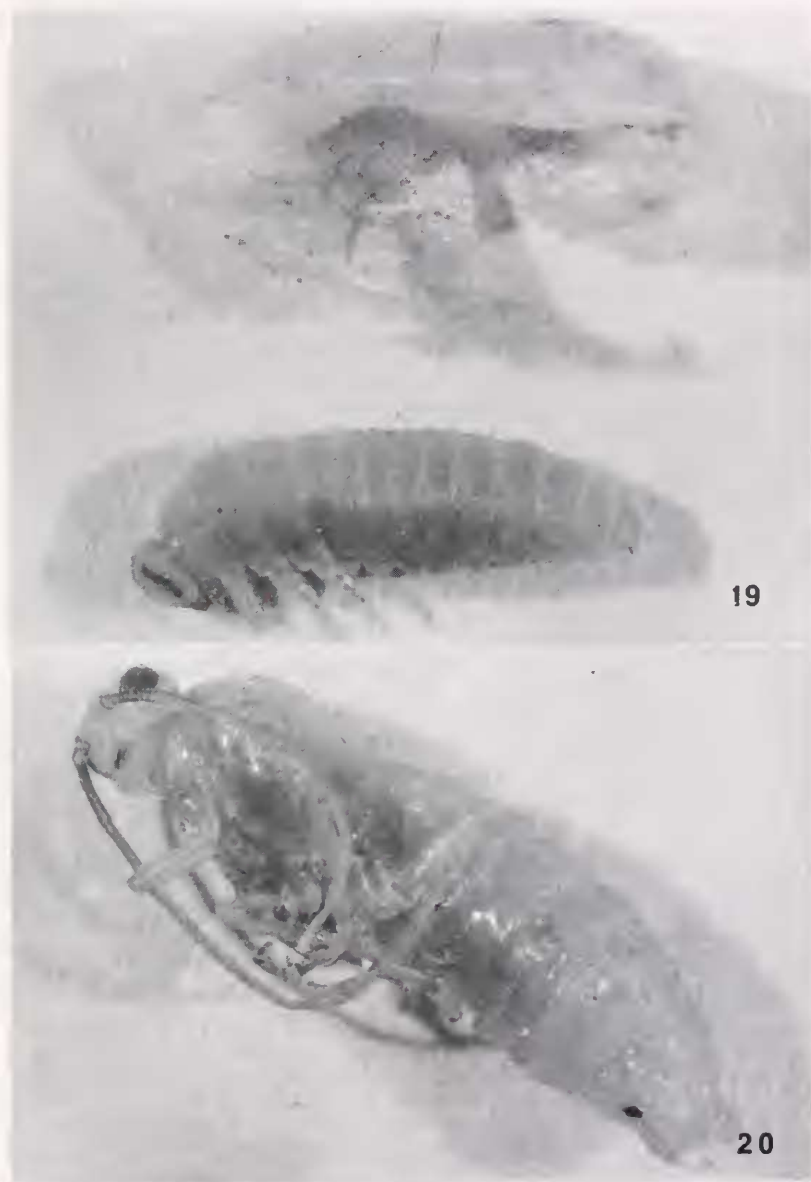
The first descriptions of the immature stages of *N. desantisi* by De Santis and Gallego de Sureda (1984), Mallea *et al.* (1985), González (1989), and Gianti and Dapoto (1990) were based principally on coloration and measurements. De Santis and Gallego de Sureda (1984) published the first figures of the mature larva, eggs in willow leaves, first-instar larva, and prepupa inside the cocoon. These same authors mentioned that the eggs of *N. desantisi* are initially oval-shaped, flat, and translucent. Conversely, Mallea *et al.* (1985), González *et al.* (1986) and González (1989) described the eggs as kidney-shaped. This latter observation agrees with our studies.

González (1989) stated that the larva of *N. desantisi* has prolegs on abdominal segments 2-8. Our studies show that the larva is typical of the Nematinae and *Nematus*, with prolegs on abdominal segments 2-7 and 10, as defined by Smith and Middlekauff (1987).

Very few sawfly larvae are known from southern South America, but the following combination of characters should aid in the recognition of the larva of *Nematus desantisi*: feeding on *Salix* spp. and *Populus* spp.; pre-



Figs. 17-18. *Nematus desantisi*. 17, First-instar larva. 18, Last-instar larva.



Figs. 19-20. *Nematus desantisi*. 19, Cocoon and prepupa. 20, Mature pupa.

sence of prolegs on abdominal segments 2-7 and 10; flat, 4-segmented antenna; mandibular dentition as described above; 5-annulate abdominal segments (segments 1-8) with setae on annulets 2-4; and presence of a pair of caudal protuberances on the epiproct.

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#### LITERATURE CITED

- De Santis, L. 1981. Estudio de una nueva plaga defoliadora del sauce criollo en la provincia de Chubut. *Novedades del Museo de la Plata* 1(1): 9.
- De Santis, L. and A. Gallego de Sureda. 1984. La falsa oruga de los sauces y álamos (*Nematus desantisi*). *Academia Nacional de Agronomía y Veterinaria, Buenos Aires* 38(7): 1-22.
- Gianti, H.E. and G.L. Dapoto. 1990. Biología, daños y posibilidades de control de la "Falsa oruga o cuncuna del sauce." *Presencia* 4(20/21): 11-12.
- González, R.H. 1989. Insectos y Acaros de importancia agrícola y cuarentenaria de Chile. *Universidad de Chile*. 310 pp.
- González, R.H., G. Barria, and M.A. Guennero. 1986. *Nematus desantisi* Smith, nueva especie de importancia forestal en Chile (Hymenoptera: Tenthredinidae). *Revista Chilena de Entomología* 14: 13-15.
- Mallea, A.R., G.S. Macola, J.G. García Saez, and S.J. Lanati. 1985. Observaciones bioetológicas sobre *Nematus desantisi* Smith, 1983 (Hymenoptera: Tenthredinidae), en Mendoza. *Intersectuum* 17(1-3): 1-14.
- Middleton, W. 1921. Some notes on the terminal abdominal structures of sawflies. *Proc. Entomol. Soc. Wash.* 23: 139-144.
- Ovruski, S.M. 1991. Estudios biológicos morfológicos de la falsa oruga de los sauces y álamos (*Nematus desantisi*) y consideraciones sobre su distribución. Tesis de graduación (Seminario). Fac. de Cs. Naturales e Instituto M. Lillo, Universidad Nacional de Tucumán, Argentina. 94 pp.
- Ovruski, S.M. and P. Fidalgo. 1991. Distribución geográfica de *Nematus desantisi* Smith (Hymenoptera: Tenthredinidae), plaga de salicáceas. *Ciência e Cultura, São Paulo* (suplemento) 43(7): 36-37.
- Smith, D.R. The first record of *Nematus* Panzer from South America: a new species from Argentina (Hymenoptera: Tenthredinidae). *Proc. Entomol. Soc. Wash.* 85: 260-262.
- Smith D.R. and W.W. Middlekauf. 1987. Symphyta, pp. 618-649. *In* Stehr, F.W., ed., *Immature Insects*. Kendall Hunt, Dubuque, Iowa. 754 pp.
- Vattuone, E.M. 1989. La falsa oruga de los sauces y álamos (*Nematus desantisi* Smith) en la provincia de Catamarca. CIRPON, *Revista de Investigación* 7(1-4): 85.
- Wong, H.R. 1963. The external morphology of the adult and ultimate larval instar of the larch sawfly, *Pristiphora erichsonii* (Hymenoptera: Tenthredinidae). *Canadian Entomol.* 95: 897-921.